

Environmental Protection Agency

Horiba Emission Analysis System CO₂ Interference Procedure

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1. Purpose

The purpose of this procedure is to describe the equipment and procedure required to perform a CO2 Interference Check on the Horiba, Mexa-7000, Automotive Emission Analysis System. The practice shall be performed at six month intervals.

The following additional equipment is required:

Portable CO2 interference kit with flex line

Container of distilled water and a funnel

2. Test Article Description

Horiba Mexa Automotive Emission Analysis System.

3. References

- 3.1 "Code of Federal Regulations," Title 40, Part 86, Subpart B, Sections 89.116, 86.119, and 86.123
- 3.2 Horiba "Automotive Emission Analysis System, Mexa-7000 User's Guide"
- 3.3 Environmental Protection Agency (EPA) current safety policies
- 3.4 "Horiba MEXA 7000 Series Training Manual"

4. Required Equipment

4.1 Horiba Mexa 7000 Automotive Emission Analysis System:

Equipment used: Main Control Unit (MCU)

Interface Control Unit (IFC)

Analyzer Rack (ANR)

Solenoid Valve Unit (SVS)

Sample handling System (SHS)

Power Supply Unit (PSU)

Heated Analyzer (OVN)

Gas Divider (GDC)

Printer

4.2 Numbered flexible quick-disconnect jumper lines.

4.3 Portable CO₂ interference kit bottle

5. Precautions

5.1 Cylinders containing compressed gases are used for this procedure. The technician must be familiar with the “EPA Laboratory Safety Manual” sections dealing with the safe handling, storage, and use of compressed gas cylinders.

Safety precautions must be followed when using compressed gases.

5.2 The Mexa 7000 Automotive Emission Analysis System must warm-up in the stand-by mode for a minimum of 2 hours after being fully powered up.

5.3 Exercise caution when operating heated units. Surface temperature may exceed 60 °C.

6. Visual Inspection

6.1 The test cell air handler should be on and test cell ambient conditions are stable.

6.2 The gas cylinder and equipment is checked for leakage, damage, and cleanliness.

- 6.7 The power is turned on for the analysis system and related equipment.
- 6.8 The Flame Ionization Detector (FID) is lit.
- 6.9 All documentation needed to operate the analysis system is present.

7. Test Article Preparation

- 7.1 Open the cylinder valve on the CO₂ bottle and ensure it is set at 14 pounds per square inch (psi).
- 7.2 At the rear of the Solenoid Valve Unit (SVS) verify that the water bubbler reservoir water level is between the blue lines.

If necessary, remove the reservoir cap and add water. See Figure 1.

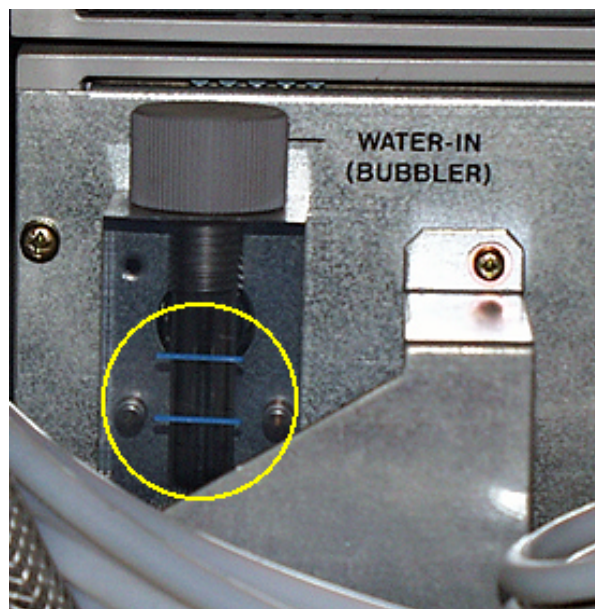


Figure 1
Water Bubbler

- 7.3 Connect the flexible quick-disconnect jumper lines between the portable CO₂ interference kit bottle and the Solenoid Valve Unit (SVS) disconnect labeled “Bottle.”

Note the value of the bottle concentration on the cylinder tag.

- 7.4 Activate the Horiba Series 7000 Bench.

Additional information is available in the Horiba “Series 7000 Users Guide.”

- 7.5 From the Main Control Unit (MCU) “Command Screen,” click on the Horiba logo button in the title bar.

From menu items that appear below the button, click on “User Level.”

If “Supervisor” is not the top menu item in the display window, click on “Supervisor.”

Use the mouse and on-screen keyboard, see Figure 2, to enter the password.
“Supervisor” will appear at the top-center of the screen in the blue area.

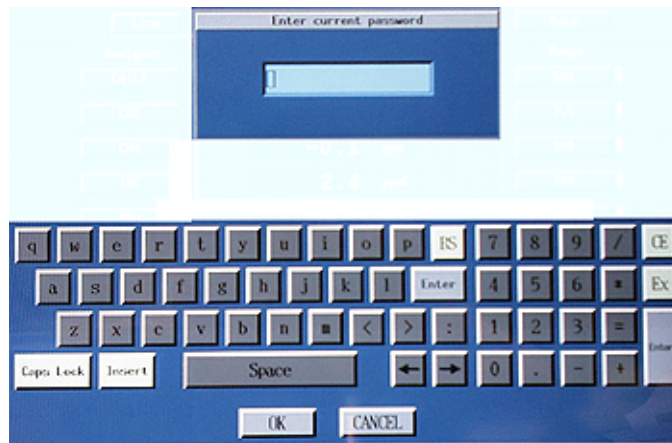


Figure 2
On-Screen Keyboard

8. Test Procedure

- 101 On the display setup portion of the screen, click on the “Menu” button. See arrow in Figure 3. From the menu items that appear, click on “Utility” (see circle in Figure 3) and the “Utility” screen will appear.

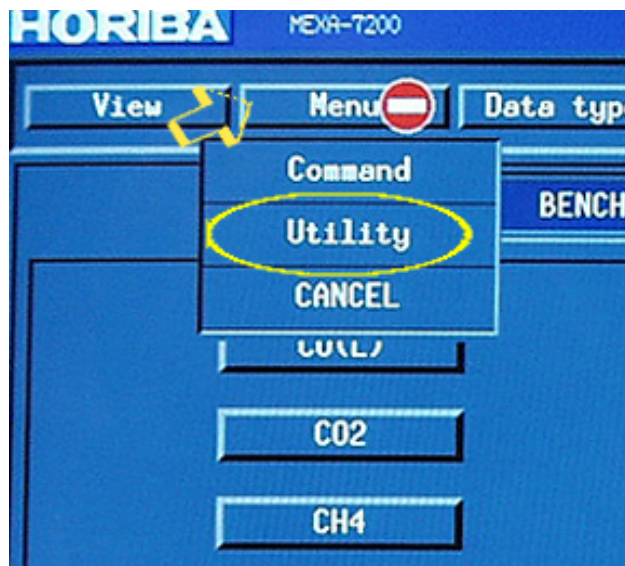


Figure 3
“Utility” screen

- 102 Click on the “Checks/Tests” button in the command area of the screen. See arrow in Figure 4. From the menu items that appear above the button, click on “Interference Check.” See the circle in Figure 4.

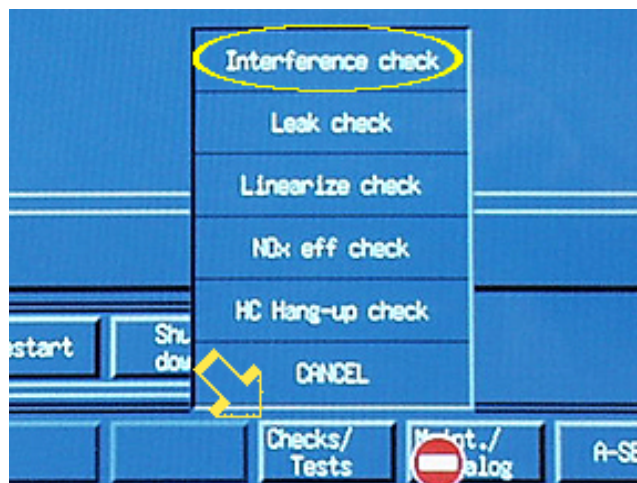


Figure 4
Check/Test Button

- 103 The “Interference Check” sub-panel will appear. If the bench to be used for testing is not selected on the sub-panel, click on the “Line” button. See arrow in Figure 5. From the menu items that appear, click on the appropriate analyzer bench. See circle in Figure 5.

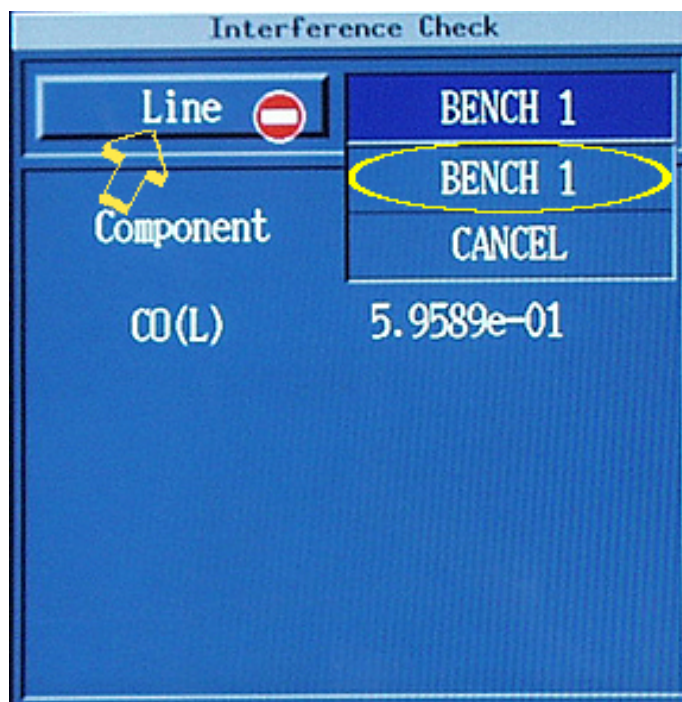


Figure 5
Interference Screen

- 104 Click on “CO₂ Configuration” button. See Figure 7.

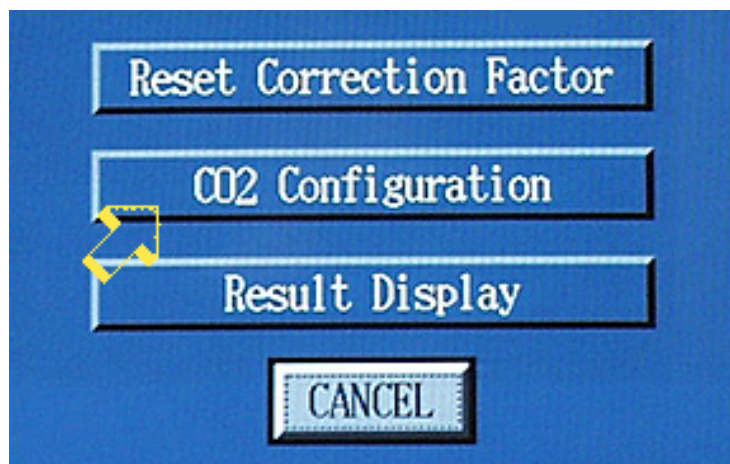


Figure 6
CO₂ Configuration Button

- 105 The “CO₂ Interference Check Config” screen will appear. See Figure 7.
Verify the following:

Limits for Line: Appropriate Bench Number

Min% full scale 0.00

Max% full scale 1.0

FS/PPM Cutoff 300

Min PPM -3

Max PPM 1

If an item needs correction, click in the field and use the on-screen keypad to enter the correct value. When done, click on “OK” on the keypad.

Click on “OK” from the “CO₂ Interference Check Config” screen.

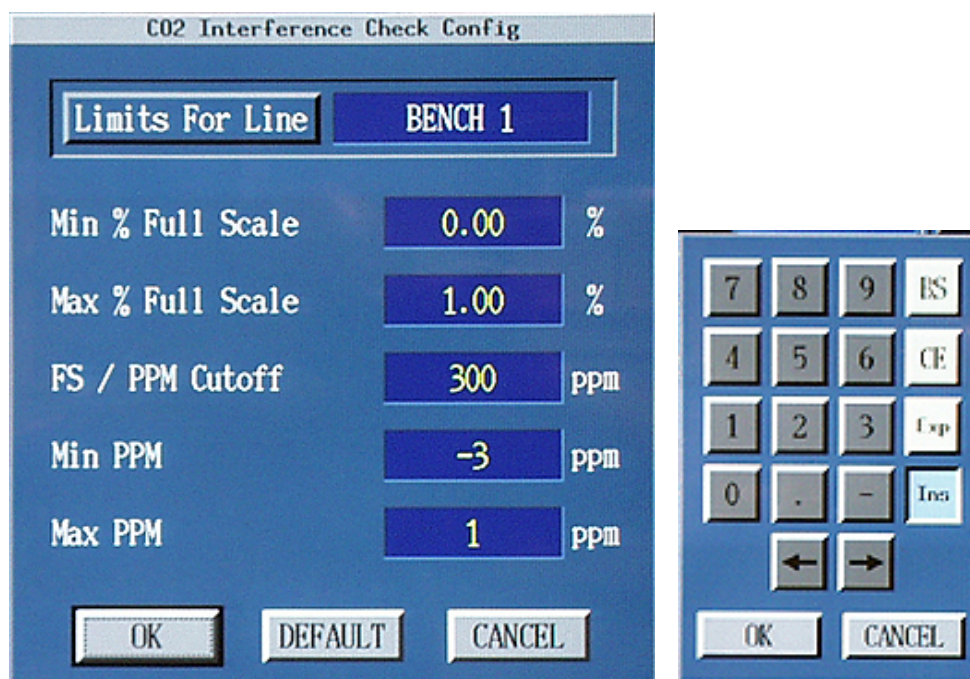


Figure 7
CO₂ Interference Check Config Screen

- 106 When "Interference Check" screen appears, click on the "Reset Correction Factor" button. See Figure 8.

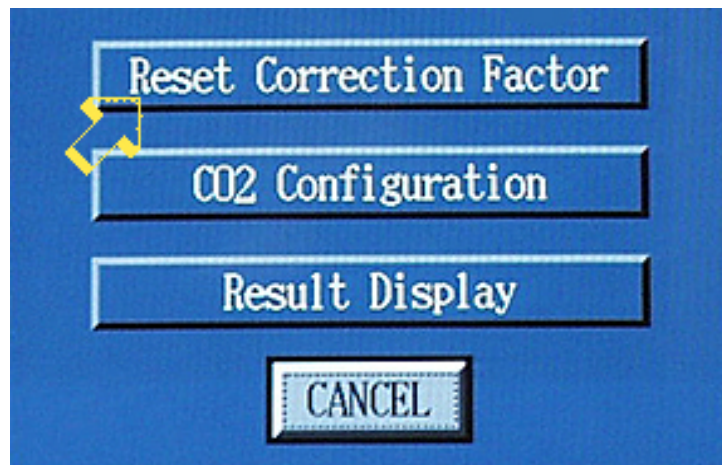


Figure 8
Reset Correction Factor screen

- 107 The "Interference Check Result Reset" subpanel will appear, click on the "Component" button. See the arrow in Figure 9.

From menu items that appear below the button, click on "CO(L)." See the circle in Figure 9.

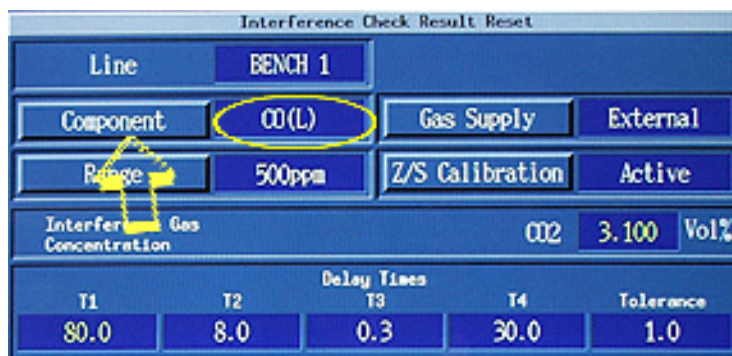


Figure 9
Interference Check Results Reset Screen

- 108 Click on the “Z/S Calibration” button. See the arrow in Figure 10. From menu items that appear below the button, click on “Active.” See the circle in Figure 10.



Figure 10
Z/S Calibration Screen

- 109 Verify that the field to the right of the “Range” button contains the appropriate range. If not, click on the “Range” button (see the arrow in Figure 11) and from menu items that appear below the button, click on the appropriate range. See the circle in Figure 11.

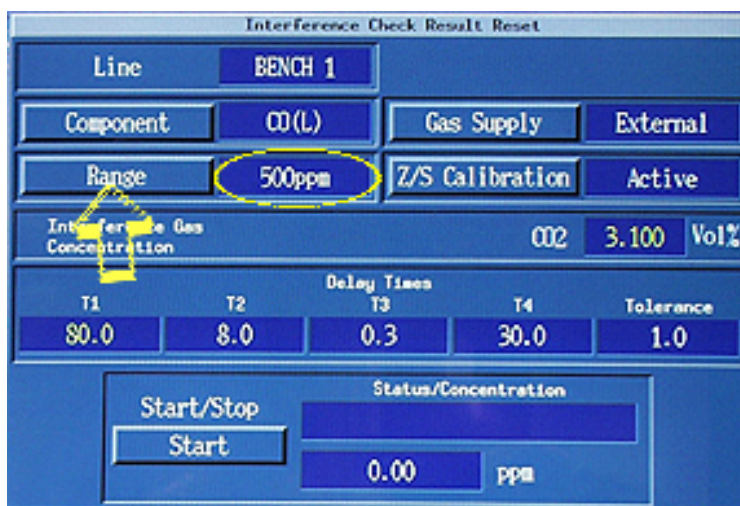


Figure 11
Select Range Screen

- 110 Verify that the field to the right of the “Gas Supply” button contains “External.” If not, click on the “Gas Supply” button (see Figure 12) and from menu items that appear below the button, click on “External.” See the circle in Figure 12.

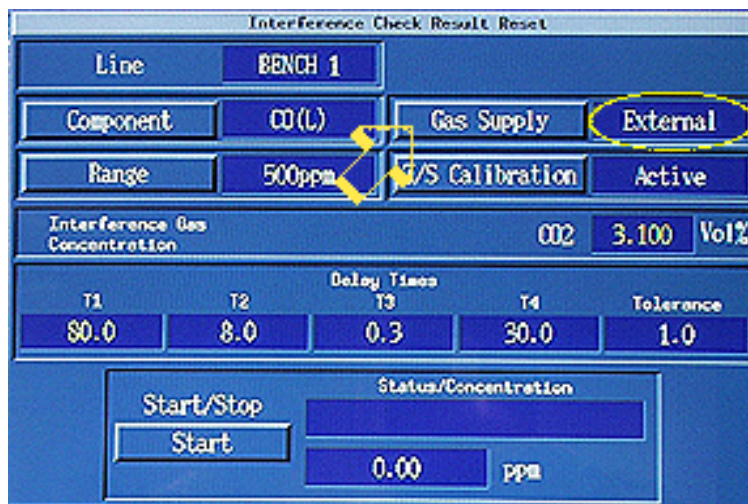


Figure 12
Select External Gas Screen

- 111 Click in the yellow user changeable field for “CO₂.” Use the on-screen keypad to enter “CE” and to enter the value noted in Step 102. See Figure 13. On the keypad, click on “OK.”

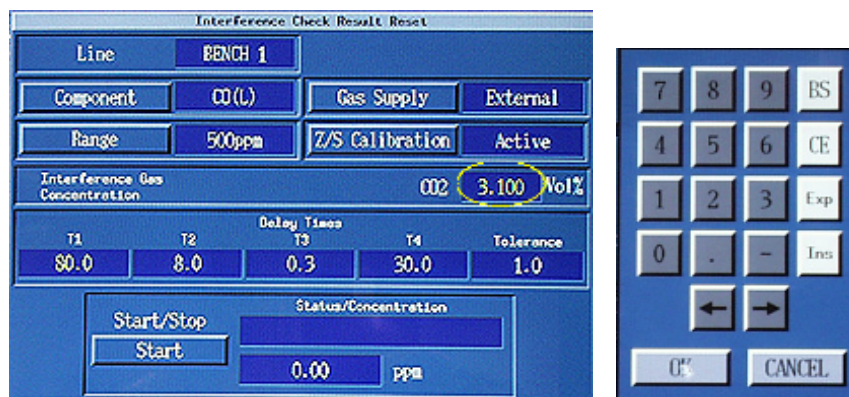


Figure 13
Enter CO₂ Concentration Screen

- 112 Verify that the field under “T1” contains “80.” See the circle in Figure 14. If not, click in the yellow user changeable field under “T1” and use the on-screen keypad, See Figure X, to enter “80.” Click on “OK.”

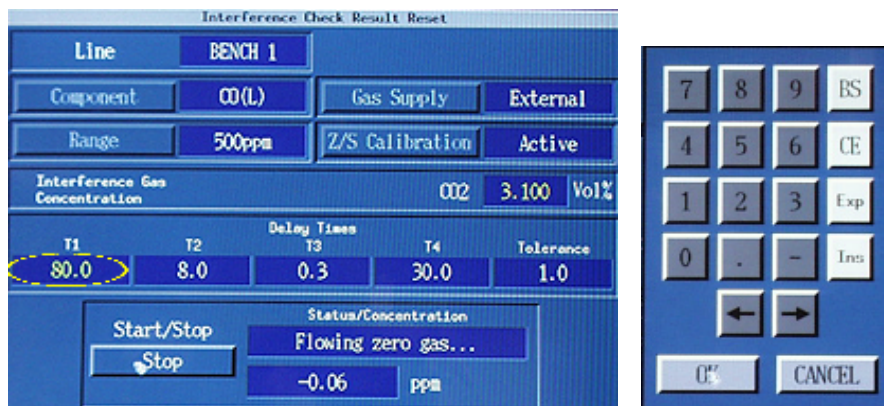


Figure 14
Enter T1 Screen

- 113 Click on the “Start/Stop” button See Figure 15.

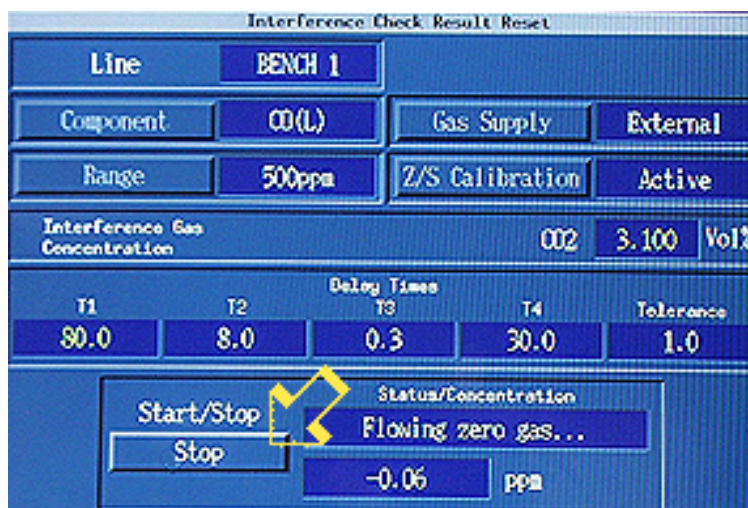


Figure 15
Start/Stop Screen

- 114 The “Analyzer Calibration” screen will appear, See Figure 16. When completed, “Calibration successfully completed” will appear. Click on “OK.” The “Interference Check Result Reset” panel will appear. If “Calibration Failed” appears, the process was not successful.

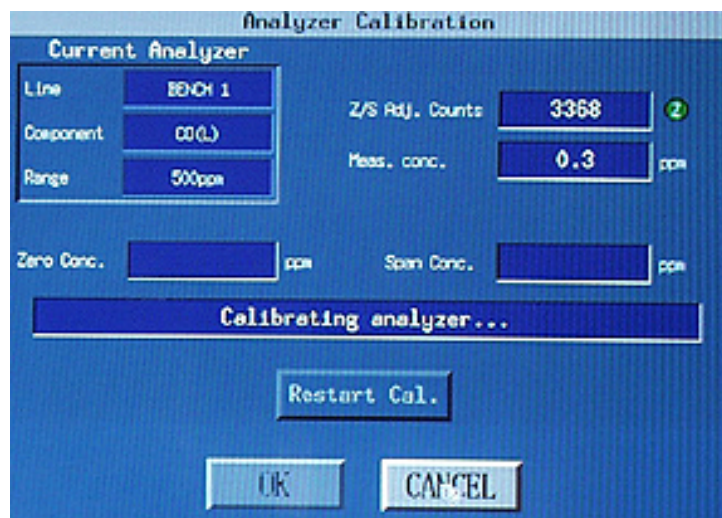


Figure 16
Analyzer Calibration Screen

- 115 During the test the status will be sequentially displayed in the “Status/Concentration” window. See Figure 17. These status types are “Flowing Zero Gas”, “Reading Zero”, “Flowing Interference Gas”, “Measuring”, “Purging with Zero Gas”, and “End.”



Figure 17
Status Indicators

- 116 The value that automatically appears in the “This check” field under “Results” must be within -3.0 to 1.0 PPM, see The circle in Figure 18. If the value is not within acceptable limits, return to Step 113 and repeat the procedure for no more than 3 times. If after 3 attempts the value is not within the acceptable limits, notify a senior technician and wait for instructions before proceeding.

Click on “Update”, see the arrow in Figure 18.

Interference Gas Concentration		CO ₂ 3.100 Vol%	
T1	T2	Delay Times	
80.0	8.0	T3	T4
		0.3	30.0
		Tolerance	
		1.0	
Start/Stop		Status/Concentration	
Start		END	
		-0.28 ppm	
Results			
Concentration		Correction factor K1	
Last check	-0.17 ppm	6.0024e-01	
This check	-0.21 ppm	5.9512e-01	
		Z/S Results	
		UPDATE EXIT	

Figure 18
Results

- 117 Click on “Result Display”, see Figure 19.

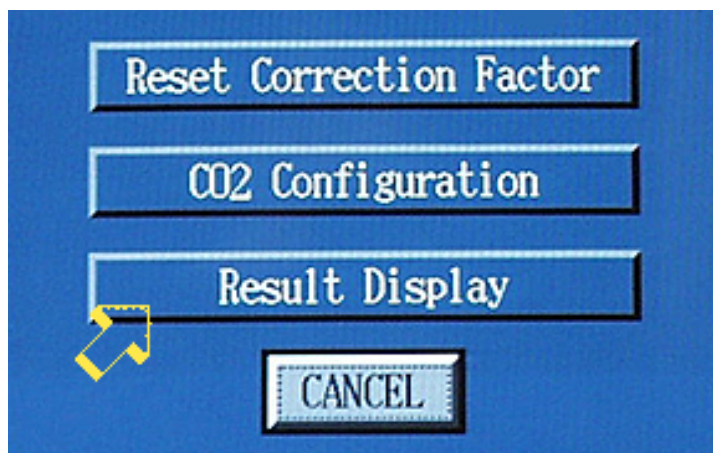


Figure 19
Result Display Button

- 118 The “Interference Check Results” subpanel will appear. See Figure 20.

Figure 20
Interference Check Results subpanel

- 119 Click on the Horiba logo button in the title bar. See the arrow in Figure 21. From the menu items that appear below the button, click on “Hardcopy.” See the circle in Figure 21.

Figure 21
Hardcopy subpanel

- 120 From menu items that appears, click on “Sub-panel”, see Figure 22.



Figure 22
Print Subpanel

- 121 Click anywhere inside the “Interference Check Results” subpanel. The “Interference Check” subpanel will automatically display and a hardcopy of the test results will print on the control room printer. Click on “Cancel.” File the print-out in the diagnostics file for the test site.
- 122 The “Utility” screen will appear. Click on the “CO(L)” button. See the arrow in Figure 23. From menu items that appear below the button, click on “Cal.” See the circle in Figure 23.



Figure 23
"Utility" Screen

- 123 An automatic zero and span calibration check of the analyzer will occur. The indicator flashes “Z” during zero and “S” during span. See Figure 24.

If the “Concentration” window displays “Over” in red letters, repeat this step once. If the “Concentration” window displays “Over” again, notify a senior technician and wait for instructions before proceeding.

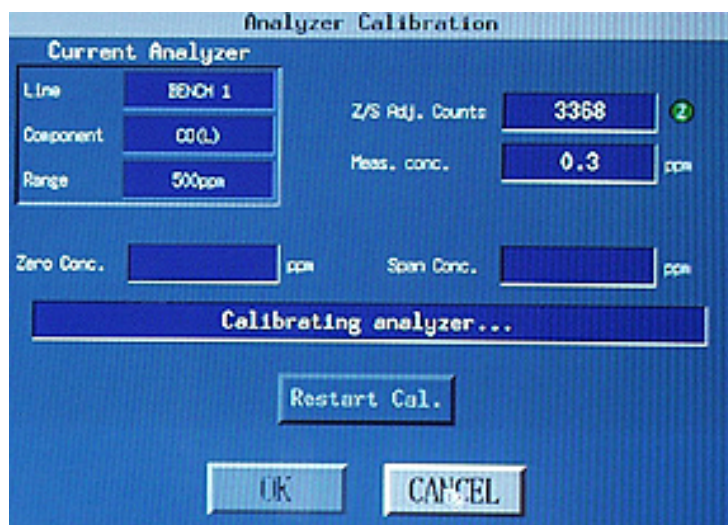


Figure 24
Analyzer Calibration Screen

- 124 Click on the “Horiba” button in the upper left corner of the screen, see Figure the arrow in 25. From the menu items that appear, click on “User Level.” See the circle in Figure 25.



Figure 25
Select User Level Screen

125 From the menu items, click on “Normal.” See Figure 26.



Figure 26
Select “Normal” User Screen

9. Data Input

9.1 In the "CO2 Field" of the "Interference Check result reset" screen, the operator enters the value from the gauge of the CO2 Bottle kit.

10. Data Analysis

- 10.1 The operator assures that the CO2 bottle is set at 14 pounds per square inch.
- 10.2 When analyzer calibration is completed, the operator checks the "Interference Check Result Reset" panel to verify that the “Calibration successfully completed” appears.
- 10.3 On the "Interference Check result reset" screen, the value that automatically appears in the “This check” field under “Results” must be within -3.0 to 1.0 PPM.
- 10.4 The operator verifies that the “Concentration” window does not displays “Over” in red letters.

11. Data Output

11.1 A hardcopy of the test results from the The “Interference Check” subpanel are filed in the diagnostics file for the test site.

12. Acceptance Criteria

- 12.1 The CO₂ bottle must be set at 14 pounds per square inch.
- 12.2 The water bubbler reservoir water level must be between the blue lines.
- 12.3 The “Limits for Line: button:” must be:
 - Min% full scale 0.00
 - Max% full scale..... 1.0
 - FS/PPM Cutoff..... 300
 - Min PPM -3
 - Max PPM 1
- 12.4 The results of the CO₂ Interference test must be within -3.0 to 1.0 PPM. If not within acceptable limits, the test is not repeated more than 3 times.
- 12.5 The “Concentration” window must not display the word “Over.”

13. Quality Provisions

- 13.1 The technician ensures all acceptance criteria (Section 12) have been met.
- 13.2 The Mexa 7000 Automotive Emission Analysis System will be warmed-up in the stand-by mode for a minimum of 2 hours.